

1. A microcontroller chip, comprising:
 - a processor for executing program instructions;
 - an array of configurable circuit blocks configured to perform a circuit function, such circuit blocks configured to produce an analog output signal; and
 - an on-chip analog amplifier having an input receiving the analog output signal and producing an amplified output signal suitable for driving a loudspeaker external to the microcontroller chip.
2. The apparatus according to claim 1, wherein the microcontroller chip has four corners, and wherein the on-chip analog amplifier is situated adjacent one of the four corners.
3. The apparatus according to claim 1, further comprising a switchable current source for selectively providing an increase in bias current to the on-chip analog amplifier under control of the processor.
4. The apparatus according to claim 1, wherein the on-chip analog amplifier comprises a tristatable CMOS analog amplifier.
5. The apparatus according to claim 4, wherein the CMOS analog amplifier comprises a tristate CMOS analog amplifier.
6. The apparatus according to claim 5, wherein a tristate mode of the tristate CMOS analog amplifier is selectably controlled by the processor.
7. The apparatus according to claim 1, wherein the on-chip analog amplifier produces an amplified output signal suitable for driving a 32 ohm loudspeaker external to the microcontroller chip.

1 8. The apparatus according to claim 1, wherein the array of configurable circuit
2 blocks comprise an array of analog circuit blocks and an array of digital circuit
3 blocks.

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5 9. The apparatus according to claim 8, further comprising a wirebond pad, and
6 wherein the amplified output signal is directed to an external loudspeaker via the
7 wirebond pad.

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9 10. The apparatus according to claim 9, further comprising switching means
10 coupled to the wirebonding pad that selectively disables a connection between the
11 configurable circuit blocks and the wirebond pad under processor control.

- 1 11. A microcontroller chip, comprising:
2 a processor for executing program instructions;
3 an array of configurable digital circuit blocks configured to perform a digital
4 circuit function;
5 an array of configurable analog circuit blocks configured to perform an
6 analog circuit function, such analog circuit blocks configured to produce an analog
7 output signal; and
8 an on-chip CMOS analog amplifier having an input receiving the analog
9 output signal and producing an amplified output signal suitable for driving a
10 loudspeaker external to the microcontroller chip.
- 12 12. The apparatus according to claim 11, wherein the microcontroller chip has
13 four corners, and wherein the on-chip analog amplifier is situated adjacent one of
14 the four corners.
- 16 13. The apparatus according to claim 11, further comprising a switchable current
17 source for selectively providing an increase in bias current to the on-chip analog
18 amplifier under control of the processor.
- 20 14. The apparatus according to claim 11, wherein the on-chip analog amplifier
21 comprises a CMOS analog amplifier.
- 23 15. The apparatus according to claim 14, wherein a tristate mode of the tristate
24 CMOS analog amplifier is selectably controlled by the processor.
- 26 16. The apparatus according to claim 11, wherein the on-chip analog amplifier
27 produces an amplified output signal suitable for driving a 32 ohm loudspeaker
28 external to the microcontroller chip.

1 17. The apparatus according to claim 11, further comprising a wirebond pad,
2 and wherein the amplified output signal is directed to an external loudspeaker via
3 the wirebond pad; and further comprising switching means coupled to the
4 wirebonding pad that selectively disables a connection between the configurable
5 analog and digital circuit blocks and the wirebond pad under processor control.
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- 1 18. A microcontroller chip, comprising:
2 a processor for executing program instructions;
3 an array of configurable digital circuit blocks configured to perform a digital
4 circuit function;
5 an array of configurable analog circuit blocks configured to perform an
6 analog circuit function, such analog circuit blocks configured to produce an analog
7 output signal;
8 an on-chip tristateable CMOS analog amplifier having an input receiving the
9 analog output signal and producing an amplified output signal suitable for driving
10 a loudspeaker external to the microcontroller chip, wherein a tristate mode of the
11 tristate CMOS analog amplifier is selectably controlled by the processor;
12 a switchable current source for selectively providing an increase in bias
13 current to the on-chip analog amplifier under control of the processor;
14 wherein the microcontroller chip has four corners, and wherein the on-chip
15 analog amplifier is situated adjacent one of the four corners.
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- 17 19. The apparatus according to claim 18, further comprising a wirebond pad,
18 and wherein the amplified output signal is directed to an external loudspeaker via
19 the wirebond pad.
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- 21 20. The apparatus according to claim 19, further comprising switching means
22 coupled to the wirebonding pad that selectively disables a connection between the
23 configurable circuit blocks and the wirebond pad under processor control.
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